1. DUBROVSKIY, A.I.; KAPLAN, R.M.

2. USSR (600)

4. Agricultural Machinery

7. Operation of the PK-1 horse gear designed by the All-Union Scientific Research Institute of Farm Machinery, Engs. A.I. Dubrovskiy, R.M. Kaplan, Sel'khozmashina no. 5, 1953.

9. Monthly List of Russian Accessions, Library of Congress, APRIL 1953. Unclassified.

Kaplan, P. M.

(R. M.)

USSR

A photometric method for measuring small concentrations of fine powder in air currents. P. M. Kaplan. *Zhur. Tekh. Fiz.* 23, 1066-71(1953).—A photometric method is described for detg. the concn. of fine powders in air currents under dynamic conditions. Results are given for kaolin, C, and talc. J. Roytar Leach

Phys

Sm

KHARIN, S.A., kandidat sel'skokhozyaystvennyy nauk; KAPLAN, R.M., kandidat tekhnicheskikh nauk.

Use of machinery in dusting cattle, sheep, and horses. Veterinariia 30 no.6:58-59 Je '53. (MLRA 6:5)

KAPLAN, R.M., inzhener.
[redacted]

Windmill for pastures in Kazakhstan. Sel'khozmashina no.5:17-19 My '54. (MLRA 7:5)
(Windmills) (Kazakhstan--Water supply, Rural) (Water supply, Rural--Kazakhstan)

KAPLAN, R. M.

USSR/Agriculture - Statistics

Card 1/1 : Pub. 123 - 8/17

Authors : Nikolaev, P. A.; Skalov, G. F.; and Kaplan, R. M.

Title : Using the regulating characteristics of the supply of Diesel engines to establish standards for agricultural work

Periodical : Vest. AN Kaz. SSR 11/1, 77-83, Jan 1954

Abstract : An attempt was made to use statistical principles in establishing norms for agricultural production using the figures for tractor supply as one of the operators. Ten Russian references (1948-1952). Graphs.

Institution : ...

Submitted : ...

USSR/Physics - Aerodynamics FD-1007

Card 1/1 : Pub. 153 - 11/24

Author : Kaplan, R. M.

Title : Approximate computation of the distribution of dust precipitated out from a horizontal jet of air

Periodical : Zhur. tekh. fiz., 24, 1041-1048, Jun 1954

Abstract : Remarks that the distribution of dust precipated out onto a horizontal plane from free jets of air is of theoretical and practical value; e.g. in heat engineering, ventilation, dusting of plants in agriculture, etc. Presents an approximate method for calcutating the precipitation of dust from free air. Four references, USSR (D. N. Lyakhovskiy, M. A. Velikanov, G. N. Abramovich, S. A. Kharin).

Institution : -

Submitted : -

Kaplan, R.M.

DUKHOV, Timofey Grigor'yevich; KAPLAN, R.M.

[The new DDK-4 windmill unit] Novaia vetronasosnaia ustanovka DDK-4. Alma-Ata, Kazakhskoe gos. izd-vo, 1955. 69 p.
(Windmills) (MLRA 9:3)

KAPLAN,R.M., inzhener; DUKMOV,T.G.

The DDK-4 windmill. Sel'khozmashina no.10:7-9 O'55. (MLRA 8:12)
(Windmills)

KAPLAN, R.M., inzhener; KUL'PIN, P.I., inzhener; ANDRIANOV, V.Ye.

Testing VOS-2 rotating casing and chain pumps. Sel'khozmashina no.10:7-10 O '56. (MLRA 9:12)

(Pumping machinery)

KAPLAN, Rafael' Markovich, kand.tekhn.nauk; VAVILIN, Dmitriy Vasil'yevich, inzh.-mekh.; GAMBURG, Yefim Moiseyevich, inzh.-mekh.; SHVYDKO, Z., red.; NAGIBIN, P., tekhn.red.

[Mechanization of production processes on dairy farms] Mekhanizatsiia proizvodstvennykh protsessov na MTF. Alma-Ata, Kazakhskoe gos. izd-vo, 1958. 172 p. (MIRA 11:12)
(Dairying) (Farm equipment)

KHAN, Aleksandr Vasil'yevich, nauchnyy sotr.; KAPLAN, Rafael' Markovich, nauchnyy sotr.; BUD'KO, V.A., red.; KETOV, G.I., tekhn. red.

[Using electric equipment at consolidated sheep-shearing stations] Elektromekhanicheskaia strizhka ovets na ukrupnennykh punktakh. Moskva, Gos. izd-vo sel'khoz. lit-ry, 1960. 46 p. (MIRA 14:8)

1. Kazakhskiy nauchno-issledovatel'skiy institut mekhanizatsii i elektrifikatsii sel'skogo khozyaystva(for Khan, Kaplan) (Sheepshearing)

KAPLAN, R. S. FDD PA 169T38

USSR/Metals - Testing Aug 50.

"Effect of the Notch on Strength of Steel at Elevated Temperatures," M. I. Kuzmanov, R. S. Kaplan, Kharkov Turbogenerator Plant imeni S. M. Kirov.

"Zavod Lab" Vol XVI, No 8, pp 975-979

Describes experiments for studying behavior of 2 steels, 40 KhN and EI 10, under continuous load at 500 and 550° and effect of the notch on their strength. Composition of steels is: 40 KhN - 0.41% C, 0.18% Si, 0.80% Mn, 0.65% Ni, 1.33% Cr; EI 10 - 0.31% C, 0.23% Si, 0.48% Mn, 1.17% Ni, 0.35% Mo, 0.15% V.

PA 169T38.

KAPLAN, R.S.

S

18

PROCESSES AND PROPERTIES INDEX

Influence of a Notch on the Strength of Steel at High Temperatures. M. I. Kurmanov and R. S. Kaplan. (Zavodskaya Laboratoriya; Hutnické Listy, 1951, vol. 6, Mar., pp. 148-149). [In Czech]. The authors investigated the influence of notches on the strength of steels stressed at 500° and 550° C. for long periods. Two low-alloy steels were used (40 Kh N with C 0·41%, Ni 0·65%, Cr 0·022%, and EI-10 with C 0·31%, Ni 1·17%, Mo 0·38%, V 0·15%). The results do not confirm the view held by some authors that additions of nickel increase the tendency of steel to hot shortness and its sensitivity to notches. Notch sensitivity appears to be influenced not only by the tendency to hot shortness, but also by the ratio of the strengths of the steel within the grains and at the grain boundaries. The grain substance of the EI-10 steel has a higher strength than the boundary substance (owing to the presence of molybdenum and vanadium carbides) and plastic deformation consists therefore of intergranular creep. At 550° C. the notch sensitivity increases rapidly owing to increased exhaustion of the plasticity of the grain boundaries, which is also indicated by lower contraction values. Carbide-forming elements are absent in the 40 Kh N steel, thus deformation occurs inside the grains. This steel has therefore a lower notch sensitivity.—R. G.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

KAPLAN, R.S.

137-58-2-4164

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 2, p 271 (USSR)

AUTHORS: Seleznev, A.G., Kaplan, R.S., Popova, N.N.

TITLE: The High-temperature Strength of Steel 1Kh13 (Prochnost' stali 1Kh13 pri povyshennykh temperaturakh)

PERIODICAL: Tr. Khar'kovsk. politekhn. in-ta, 1957, Vol 11, pp 45-53

ABSTRACT: A study was made of two heats of steel 1Kh13 and one heat of steel 2Kh13 after both had been normally heat-treated. The σ_b, σ_s, δ, ψ, and a_k values were determined at temperatures ranging from 20 to 550°C, and the influence of the deformation rate on changes in the mechanical properties was investigated. It was found that steels 1Kh13 and 2Kh13 are not sensitive to tempering brittleness. Within the 300-350° temperature range a determination was made of the long-term rupture strength over periods of 1,000-100,000 hours, of the creep limit over periods of 10,000 and 100,000 hours, and of the stresses producing a 1 percent deformation. The long-term rupture strength for a >6,000-100,000 hour life was obtained by extrapolation from the long-term strength curves. To investigate the stability

Card 1/2

137-58-2-4164

The High-temperature Strength of Steel 1Kh13

of the structure and properties, the mechanical properties of the steels were determined at room temperature after a prolonged heating (up to 5,000 hours) at 470 and 530°, with subsequent cooling in air. Steel 1Kh13 was found to have stable properties when heated for long periods (up to 5,000 hours) at temperatures up to 550°. When stressed for long periods at these same temperatures it exhibited eminently plastic properties. Its strength was not impaired by notching; the long-term strength of the notched bars exceeded by 50 percent that of the smooth bars.

T.F.

1. Steel--Tensile properties 2. Steel--Temperature effects 3. Steel--Deformation

Card 2/2

SOV/126-6-6-23/25

AUTHORS: D'yachenko, S.S. and Palatnik, L.S., Kaplan, R.S., German, S.I. and Butko, N.I.

TITLE: Structural Changes in the Steel 20KhM-L After Holding for a Long Time at Elevated Temperatures (Strukturnyye izmeneniya v stali 20KhM-L pri dlitel'nykh teplovykh vyderzhkakh)

PERIODICAL: Fizika metallov i metallovedeniye, 1958, Vol 6, Nr 6, pp 1122-1129 (USSR)

ABSTRACT: The stability of the structure of the steel 20KhM-L at elevated temperatures was investigated and the influence was elucidated of the applied stresses on structural changes. Specimens of this steel were investigated after normalisation annealing for 3 hours at 650 - 680°C (initial state) and after holding them for various durations in the loaded and no-load state at various temperatures. The composition of this steel was as follows: C 0.15%, Si 0.30%, Mn 0.61%, S 0.026%, P 0.039%, Cr 0.5% and Mo 0.55%. The mechanical characteristics of the specimens after holding them at various temperatures between 530 and 550°C for durations up to 5400 hours are entered in Table 2. The investigations included

Card 1/3

SOV/126-6-6-23/25

Structural Changes in the Steel 20KhM-L After Holding for a Long Time at Elevated Temperatures

metallographic, X-ray and electron-microscopic studies. It was established that carbide particles appear in the ferrite grains only after tempering in the temperature range 650 - 680°C but not at lower temperatures. Changes in the tempering temperature are accompanied by insignificant changes in the lattice parameter of the α-phase (2.8624 kX after tempering at 570°C and 2.8615 after tempering at 650°C). It was established from X-ray diffraction patterns that after normalisation annealing and tempering at 650 to 680°C for 3 hours, a mixture of 3 carbides can be detected in the carbide precipitate with the structure: $Cr_{23}C_6$, Mo_2C and Fe_2Mo_2C. In the case of long-duration holding at 500 - 550°C, a coalescence of carbides takes place as a result of which carbide-free zones form at the boundaries of pearlitic grains. Coalescence leads to a growth of carbides of the structure $Cr_{23}C_6$ and to the dissolution of Mo carbides which can be explained by the low stability of the latter caused by the fact that they have a higher degree of dispersion than carbides of the type

Card 2/3

SOV/126-6-6-23/25

Structural Changes in the Steel 20KhM-L After Holding for a Long Time at Elevated Temperatures

$Cr_{23}C_6$. Stresses which are near to the yield point of the steel lead to an acceleration of the process of coalescence by one order of magnitude at 530°C and by two orders of magnitude at 550°C. Due to the dissolution of Mo carbides, the α-phase becomes enriched with alloying elements and this should have a favourable influence on the high-temperature characteristics of components made of this steel. There are 3 tables, 5 figures and 16 references, of which 12 are Soviet, 2 French, 1 German and 1 English.

ASSOCIATION: Khar'kovskiy politekhnicheskiy institut imeni V.I.Lenina. Khar'kovskiy turbinnyy zavod im. S.M.Kirova (Khar'kov Polytechnical Institute imeni V.I.Lenin, Khar'kov Turbine Works imeni S.M.Kirov)

SUBMITTED: April 11, 1957, after revision, September 7, 1957.

KAPLAN, R.S.

PHASE I BOOK EXPLOITATION SOV/3559

Akademiya nauk SSSR. Institut metallurgii. Nauchnyy sovet po probleme zharoprochnykh splavov

Issledovaniya po zharoprochnym splavam, t. 5 (Investigations of Heat-Resistant Alloys, Vol 5) Moscow, Izd-vo AN SSSR, 1959. 423 p. Errata slip inserted. 2,000 copies printed.

Ed. of Publishing House: V.A. Klimov; Tech. Ed.: I.F. Kuz'min; Editorial Board: I.P. Bardin, Academician, G.V. Kurdyumov, Academician, N.V. Ageyev, Corresponding Member, USSR Academy of Sciences (Resp. Ed.), I.A. Oding, I.M. Pavlov, and I.F. Zudin, Candidate of Technical Sciences.

PURPOSE: This book is intended for metallurgical engineers, research workers in metallurgy, and may also be of interest to students of advanced courses in metallurgy.

COVERAGE: This book, consisting of a number of papers, deals with the properties of heat-resisting metals and alloys. Each of the papers is devoted to the study of the factors which affect the properties and behavior of metals. The effects of various elements such as Cr, Mo, and W on the heat-resisting properties of various alloys are studied. Deformability and workability of certain metals as related to the thermal conditions are the object of another study described. The problems of hydrogen embrittlement, diffusion and the deposition of ceramic coatings on metal surfaces by means of electrophoresis are examined. One paper describes the apparatus and methods used for growing monocrystals of metals. Boron-base metals are critically examined and evaluated. Results are given of studies of interatomic bonds and the behavior of atoms in metal. Tests of turbine and compressor blades are described. No personalities are mentioned. References accompany most of the articles.

Savitskiy, F.S., and K.V. Popov. Study of Certain Problems of the Temperature Dependence of the Plasticity of Steel From the Viewpoint of the Dislocation Theory 150

Gruzin, P.L., L.V. Pavlinov, A.D. Tyutyunnik (Deceased), and G.B. Fedorov Self-Diffusion in Chromium and Molybdenum 155

Fedortsov-Lutikov, G.P., M.F. Shesheney, R.S. Kaplan, R.I. Butko, and L.S. Kartasheva. Investigation of the Properties of EI 736 Steel 160

Fedortsov-Lutikov, G.P., F.I. Prakhutsis, and M.I. Solomonts. Cast Austenitic Steels for Service at Temperatures of 650°-700°C 166

Tseytlin, V.Z., N.A. Filatova, A.V. Ryabchenkov, A.I. Maksimov, S.A. Iodkovskiy A.S. Loboda, D.I. Berezhkovskiy, V.K. Novitskiy, and M.Ya. Dzugutov. Heat-Resistant Alloy for Automotive and Stationary Gas Turbines 173

Mints, R.S. The Effect of Elements of Groups IV to VIII of the Periodic Table on the Properties of Phase Ni3Al 179

Detkovskiy, S.I. The Effect of Hardness and Grain Size on the Thermal Fatigue of Heat-Resistant Steel 187

Portnoy, K.I., and G.V. Samsonov. Study of Boride-Base Materials 192

Arzhanyy, P.M. Study of Phase Composition of the Diffusion Layer 199

Agayev, B.A. On the Theory of Recovery and Complex Alloying of Steels 203

Bakhmetsiy, Yu.A., N.G. Girshovich, Yu.Ya. Pilyak, G.P. Kochkarova, M.V. Antipov, I.V. Grydzhin, and A.Ya. Ioffe. Castability of Heat-Resisting Alloys 210

Medovar, B.I., and A.M. Safonnikov. Metallurgical Problems in Electroslag Welding of Heat-Resisting Austenitic Steels and Nickel-Chromium-Base Alloys 220

Paton B.Ye., B.I. Medovar and Yu.V. Latash. Improvement of Quality and Workability of Alloyed Steels and Alloys by Means of Electroslag Remelting in Water-Cooled Metal Molds 228

Lyubinskiy, B.B. The Effect of Small Amounts of Addition Agents on the Property of Nickel-Base Alloys 234

Chizhikov, D.M., and A.M. Grin'ko. The Formation and Dissociation of Niobium Iodides 240

Pavlov, I.M. Forming of Hard-to-Form Alloys 245

Rastegayev, M.V., and A.N. Danil'chenko. Specific Deformation Work [per Unit of Volume] of Certain Alloys 255

Maslov, A.T., and A.M. Samarin. Mechanical Properties of Deformed Chromium 260

Korneyev, N.I., I.G. Skugarev, S.B. Pevzner, and Ye.I. Razuvayev. Thermomechanical Regime of Forming High-Melting Molybdenum-Base and Chromium-Base Alloys 269

SKRYAKOV, Ivan Maksimovich; Prinimali uchastiye: BEDAREV, G.; VETSRUMB, N.; DOBROVOL'SKIY, V.; KAPLAN, S.; KOMZA, G.; KOROLEV, L.; KUZGINOV, K.; PETROV, V.; SUMAKOV, N.; SMOLYANINOV, N.; USHAKOV, I.; USHAKOV, G.; ZAYCHIK, M.I., prof., doktor tekhn.nauk, nauchnyy red.; KOLOMIYTSEVA, O.I., red.; ROZIN, B.A., tekhn.red.

[The story of the tractor] Povest' o traktore. Moskva, Izd-vo "Sovetskaia Rossiia," 1960. 318 p. (MIRA 13:12)
(Tractors)

ARLAZOROV, M.; KAPLAN, S.

The UT-2 training plane with an M-11 engine. Voen. znan. 25 no.5: 12-13 My '49. (MIRA 12:12)
(Airplanes)

APPROVED FOR RELEASE: 06/13/2000 CIA-RDP86-00513R000520430012-4"

KAPLAN, S., inzhener; BALYANOV, S., inzhener.

Nonstop processes in sewing artels. Prom.koop.no.3:20-21 Mr '56.
(Moscow--Clothing industry) (MLRA 9:7)

KAPLAN, S.

"Structure and evolution of stars" by M.Schwarzschild and "Physical processes in stars" by D.A.Frank-Kamenetskii. Reviewed by S.Kaplan. Astron.zhur. 39 no.4:770-771 Jl-Ag '62. (MIRA 15:7)
(Stars) (Schwarzschild, M.) (Frank-Kamenetskii, D.A.)

KAPLAN S. A.

MATSKIN, L.A.; KOVALENKO, K.I.; BABUKOV, V.G.; KONSTANTINOV, N.N.; PONOMAREV, G.V.; PAL'CHIKOV, G.N.; PELENICHKO, L.G.; SHAMARDIN, V.M.; GLADKOV, A.A.; BRILLIANT, S.G.; SHEVCHUK, V.Ya.; SOSHCHENKO, Ye.M.; ALEKSANDROV, A.M.; BUNCHUK, V.A.; KRUPENIK, P.I.; MAYEVSKIY, V.Ya.; YELSHIN, K.V.; GAK, Kh.A.; POTAPOV, G.M.; KARDASH, I.M.; STEPURO, S.I.; KAPLAN, S.A.; SELIVANOV, T.I.; YEREMENKO, N.Ya.; ZHUZH, A.D.; USTINOV, A.A.; GIRKIN, G.M.; VOLOBUYEV, P.P.; CHERNYAK, I.L., nauchnyy red.; DESHALYT, M.G., vedushchiy red.; GENNAD'YEVA, I.M., tekhn.red.

[Combating losses of petroleum and petroleum products; materials of the All-Union Conference on Means of Combating Losses of Petroleum and Petroleum Products] Bor'ba s poteriami nefti i nefteproduktov; po materialam Vsesoiuznogo soveshchaniia po bor'be s poteriami nefti i nefteproduktov. Leningrad, Gos.nauchno-tekhn. izd-vo neft. i gorno-toplivnoi lit-ry, 1959. 157 p. (MIRA 13:2)

1. Nauchno-tekhnicheskoye obshchestvo neftyanoy i gazovoy promyshlennosti.

(Petroleum industry)

KAPLAN, S.A.

Selection of the optimum conditions of exciting elastic vibrations. Geofiz. razved. no.9:28-36 '62. (MIRA 15:9)
(Seismic prospecting)

KAPLAN, Samuil Aronovich; PIKEL'NER, Solomon Borisovich; ~~AMBARTSUMYAN, V.A.~~, red.; MUSTEL', E.R., red.; SEVERNYY, A.B., red.; SOBOLEV, V.V., red.; KULIKOV, G.S., red.; AKSEL'ROD, I.Sh., tekhn. red.

[Interstellar medium] Mezhzvezdnaia sreda. Moskva, Fizmatgiz, 1963. 531 p. (MIRA 17:2)

APPROVED FOR RELEASE: 06/13/2000 CIA-RDP86-00513R000520430012-4"

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

PROCESSES AND PROPERTIES INDEX

N

8

910 On Circular Orbits in Einstein's Gravitation Theory. S. A. Kaplan. Zhur. Eksptl. i Teoret. Fiz. 19, 951-2 (1949) (Letter to the editor, in Russian).

Einstein (Ann. Math. 40, 4(1939)) and Oppenheimer (Phys. Rev. 55, 374(1939)) have found that for certain physical configurations in Einstein's gravitational field there exists a limiting value of the radius, below which the configurations are unstable. The present author shows that this property is shared by circular orbits. The minimum radius of stable orbits is $r = 6m$, where m is the mass of the central body and the units are those of the relativistic gravitation theory, (the gravitational constant $G = 1$, $c = 1$); on this orbit, the energy E of the revolving body has a minimal value, equal to $m_1 \left(\frac{8}{9}\right)^{1/2}$, where m_1 is the mass of the revolving body, ($m_1 \ll m$).

Lvov astronomical Observatory

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

PA 156T9

KAPLAN S.A.

Jan/Feb 50

USSR/Astronomy - Stellar Energy
Stellar Temperatures

"Cooling of White Dwarfs," S. A. Kaplan, L'vov Astr Obs, 3 pp

"Astron Zhur" Vol XXVII, No 1

Investigates radiation of thermal energy by white dwarfs. Shows cooling state insures observable illumination in the course of sufficiently long intervals of time, at least for some white dwarfs. Finds dependence between brightness of white dwarf and its time of existence.

156T9

[redacted]

KAPLAN, S.A.

PA 161T3

USSR/Astronomy - Galaxy May/Jun 50

"The Galaxy's Time of Rotational Relaxation," S. A. Kaplan, L'vov Astr Obs, 3 pp

"Astron Zhur" Vol XXVII, No 3

Considers nonpotential irregular forces in a rotating stellar system to determine relaxation time.

161T3

KAPLAN, S. A.

USSR/Astronomy - Nebulae May/Jun 52

"Reflection of Light by Dust Nebulae," S. A. Kaplan, L'vov State U imeni Ivan Franko

"Astron Zhur" Vol XXIX, No 3, pp 326-333

Studies of reflection by dust nebulae may give data on their structure and on properties of dust particles. Author applies scattering theories by V. A. Ambartsumyan ("Astron Zhur" 19, 5, 1942) and V. V. Sobolev ("Astron Zhur" 28, 355, 1951) and criticizes American methods. He derives some formulae and anticipates results in the future. Received 14 Jan 52.

217T52

KAPLAN, S. A.

USSR/Astronomy - Stellar Radiation Nov/Dec 52

"Energy of Total Radiation of Stars," S. A. Kaplan, Astron Observ at the L'vov State U

"Astron Zhur" Vol 29, No 6, pp 649-653

Computes distribution of energy flow of total radiation of stars in regions of interstellar space near the galactic plane in vicinity of the sun and tabulates computed and observed values. Indebted to I. S. Shklovskiy and V. S. Safronov. Submitted 22 May 52.

239T73

KAPLAN, S. A.

PA 240T81

USSR/Astronomy - Cosmical Aerodynamics 21 Dec 52

"Conditions Governing Nonvortical Flow of Gas in Interstellar Space," S. A. Kaplan, L'vov Astron Observ

"DAN SSSR" Vol 87, No 6, pp 909-912

States that A. A. Fridman (cf. "Experiment in Hydromechanics of Compressible Liquid," 1934) was first to obtain conditions for which a nonvortical gas flow remains so, namely [grad T, grad S] $\equiv$ 0 and [grad V, grad p] $\equiv$ 0. Analyzes formulas of Lagrange and Euler. Presented by Acad G. A. Shayn 27 Oct 52.

240T81

KAPLAN, S.A., dotsent.

Formation of stars. Dop.ta pov.L'viv.un. no.4, pt.2: 74-75 '53. (MLRA 9:11)

(Stars)

KAPLAN, S.A.

The condensation of interstellar gas on particles of cosmic dust.
Nauk.zap.L'viv.un. 22:111-114 '53. (MLRA 10:5)
(Interstellar matter)

KAPLAN, S.A.

The interaction of cosmic hydrogen with cosmic dust and density of Lα radiation in the interstellar space. Nauk.zap.L'viv.un. 22:115-120 '53. (MLRA 10:5)

(Interstellar matter)

124-58-9-10031

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 9, p 84 (USSR)

AUTHOR: Kaplan, S. A.

TITLE: To the Theory of the Acceleration of Charged Particles Due to a Turbulent Magnetic Field (K teorii uskoreniya zaryazhennykh chastits turbulentnymi magnitnymi polyami)

PERIODICAL: Tsirkulyar. Astron. observ. L'vovsk. un-ta, 1953, Nr 27, pp 1-10

ABSTRACT: Development of a theory for the acceleration of charged particles due to inductive electrical fields which arise during magnetogasdynamic motions. Various cases of the interaction between the charged particles and such fields are examined. A kinetic equation is set up for determining the spectrum of high-speed charged particles, and methods for its solution are indicated.

Author's Resumé

1. Particles--Acceleration 2. Particles--Magnetic effect 3. Acceleration--Theory 4. Mathematics--Applications

Card 1/1

KAPLAN, S. A., and KLIMISHIN, I. A.

Scattering of Light in Spherical Nebulas

A model of a spherical nebula is designed, its optical radius exceeding the geometrical one, and receiving on its internal boundary the luminous flow of the central star. Assuming the spherical scattering index to be known, the luminous intensity on the boundary is computed. The abstractor, I. N. Minin, found some errors in the computation. (RZhAstr, No. 9, 1955) Tsirkular Astronom. Observ. Lvovsk. Un-ta, No. 27, 1953, 11-16

SO: Sum. No. 744, 8 Dec 55 - Supplementary Survey of Soviet Scientific Abstracts (17)

KAPLAN, S.A.; KLIMISHIN, I.A.

Density limits for white dwarfs. TSir.Astron.obser.L'viv.un. no. 27:17-22 '53 (MIRA 13:10)

(Astrophysics)

KAPLAN, S. A. Jul/Aug 53

USSR/Astonomy - Cosmogony

"Problem of the Origin of Stars," S. A. Kaplan, L'vov Astron Observatory

Astr Zhur, Vol 30, No 4, pp 391-393

From analysis of data discussed at the Moscow conference in May 52, the author assumes that it should be possible to estimate the absolute bolometric values and proportions with which newly formed stars enter the upper main sequence. Received 10 Jun 52/

262T27

KAPLAN, S. A.; PRONIK, V. I.

Gases, Interstellar

Turbulent character of the motion of interstellar gaseous clouds. Dokl. AN SSSR 89, No. 4, 1953. L'vov State U im. Franko, pp 643-46.

To confirm that motion of interstellar gaseous clouds is of a turbulent nature, the authors investigate radial velocities, using catalogue of W. S. Adams (Ap.J. 109, 1949). Conclude that motion of interstellar gaseous clouds obeys, in the first approximation, laws of isotropic and local turbulence. Presented by Acad G. A. Shayn 6 Feb 53.

256T86

Monthly List of Russian Accessions, Library of Congress, June 1953. Uncl.

KAPLAN, S.A.

USSR

523.161

7992. Quantitative characteristics of the turbulence of the interstellar gas. S. A. KAPLAN. *Dokl. Akad. Nauk SSSR*, 89, No. 5, 801–4 (1953) *In Russian.*

Discusses the fundamental scale of turbulence (i.e. the maximum size of eddies for which the turbulence can be looked upon as being locally isotropic), which is evaluated at $\simeq 90$ parsec, the velocity of the eddies being $\simeq 4{\cdot}3$ km/sec, and the mean period of a significant velocity change being $\simeq 2\times10^7$ years. It is assumed that the fundamental source of energy of the turbulent motion of the gas clouds is to be looked for in the fluctuations of the pressure of radiation of the hot stars (type O and B), and the value of ϵ (energy of turbulent motion, dissipated per second in 1 g of interstellar gas) obtained on this basis agrees with results obtained by other methods. P. LACHMAN

KAPLAN, S.A.; TEAP, T.T.

Ionization functions of the elements C I, Na I, K I, Ca I, Ca II in interstellar space. Astron.tsir. no.137:6-7 Ap '53. (MLRA 6:8)

1. L'vovskaya astronomicheskaya observatoriya. (Gases, Interstellar)

APPROVED FOR RELEASE: 06/13/2000 CIA-RDP86-00513R000520430012-4"

KAPLAN, S.A.

Effect of star distance on the "eccentricity -- semi-major axis" correlation. Vop.kosm. 2:269-272 '54. (MIRA 8:5)
(Stars, Double)

Kaplan, S. A.

1 - F/W

Kaplan, S. A. Spectral theory of gas-magnetic isotropic turbulence. Ž. Eksper. Teoret. Fiz. 27, 699–707 (1954). (Russian)

The aim of the paper under review has been to present certain solutions of the equations governing the energy distribution in the spectrum of an (isotropic) hydromagnetic turbulence; the equations themselves having been previously discussed by the author [Dokl. Akad. Nauk SSSR (N.S.) 94, 33–36 (1954); MR 15, 1001]. In the case of a stationary solution, the spectrum of the kinetic as well as magnetic energy is continuous, and its slope is characterized by an exponent α in the law $F(k) \sim k^{-\alpha}$ ($k = 2\pi/l$, l being the size of a turbulent element) in the neighbourhood of 1.6, depending but slightly on the scale of the flow, velocity of sound, dissipation of energy through shock waves, etc.). If $\lambda > \nu$ ($\lambda = c^2/4\pi\sigma$, σ being the coefficient of electrical conductivity, and ν the viscosity coefficient), a second solution may apply, in which the exponent α in the spectrum of the kinetic energy is in the neighbourhood of 5/3, and in the spectrum of the magnetic energy, $\alpha \sim -1/3$. In the last part of the paper, the author applies his spectral theory to study of nonstationary turbulence.

Z. Kopal.

I-F/W

Kaplan, S. A. **Isothermal flow of a gas in interstellar space. Discontinuities in density and velocity.** Astr. Ž. 31, 31-35 (1954). (Russian)

The author's aim is to analyze the distribution of velocity and density in plane gas flows which may arise in interstellar space. In the first part of the paper under review the equations of one-dimensional gas flow are set up, and approximate solutions obtained in the form of series expansions in ascending powers of the parameter $w=\log(\rho/\rho_0)$, where ρ denotes the instantaneous density at any point of the actual gas flow, and ρ_0 the density of the undisturbed medium. In the second part of his paper, the author considers the possibility of the formation of plane shocks in such a flow, and determines the corresponding density and velocity jumps across the shock front. *Z. Kopal* (Manchester).

KAPLAN, S. A.

Subject : USSR/Astronomy AID - P-230

Card : 1/1

Author : Kaplan, S. A.

Title : Function of Velocity Distribution of a Turbulent Movement of Interstellar Gas

Periodical : Astron. zhur., v. 31, 2, 137-140, Mr - Ap 1954

Abstract : A theoretical deduction of the function of distribution of velocities in a turbulent movement. The observed function of distribution of velocities is constructed upon observation data of the radial velocities of interstellar gaseous clouds. This function is found to be in close agreement with the theoretical deduction. Formulae, a graph, 4 references (after 1948), all non-Russian.

Institution : Lvov Astronomic Observatory

Submitted : October 16, 1953

КАПЛАН, С.А.

AID P - 428

Subject : USSR/Astronomy

Card 1/1 Pub. 8, 7/16

Author : Kaplan, S. A.

Title : Possible Explanation of the Structure of Fibrcus Nebulae

Periodical : Astron. zhur., v. 31-4, 358-359, Jl-Ag 1954

Abstract : Fibrous structure is a characteristic property of interstellar nebulae and directly results from the fundamental laws of motion of the interstellar media. Two explanations are discussed: of J. H. Oort-shock waves and of Shayn and Gaze-electromagnetism. Difficulties are surmounted by combining both; filament formation is the result of the velocity parameter determining the jump in thickening of density in an electromagnetic field. Formulae, 3 references.

Institution : L'vov Astronomic Observatory

Submitted : December 20, 1953

КАПЛАН, С.А.

AID P - 429

Subject

Card 1/1 Pub. 8, 8/16

Author : Kaplan, S. A.

Title : Preservation of Circulation of Velocity in Magnetic Gas Dynamics

Periodical : Astron. zhur., v. 31-4, 360-361, Jl-Ag 1954

Abstract : Under cosmic conditions, the motion of a gas must be expressed in equations of magnetic gas dynamics and depends on the intensity of the magnetic field. Therefore, circular motion can not be preserved, and the motion which was potential initially will develop into a whirl and turbulence. Formulae, 4 references.

Institution : L'vov Astronomical Observatory

Submitted : December 20, 1953

KAPLAN, S.A.

Kaplan, S. A. A system of spectral equations of magneto-gas-dynamic isotropic turbulence. Doklady Akad. Nauk SSSR (N.S.) 94, 33–36 (1954). (Russian)

In this paper an attempt is made to generalize Heisenberg's theory of turbulence [Z. Physik 124, 628–657 (1948); these Rev. 11, 63] to the case when the fluid considered is an infinitely good electrical conductor and spontaneously generated turbulent magnetic fields are possible. Just as Heisenberg replaced the transfer term representing the exchange of energy between the different Fourier components by an expression involving the spectrum of turbulence, the author replaces the terms representing the interaction of the velocity field with the magnetic field (the term $\mathbf{j}\times\mathbf{H}$ in the equation of motion and the term curl $(\mathbf{u}\times\mathbf{H})$ in the equation for H) by similar heuristic expressions involving the spectrum of u and of $\mathbf{H}$. The paper is qualitative in its contents. *S. Chandrasekhar* (Williams Bay, Wis.).

gen P.E.

USSR/Nuclear Physics - Acceleration of charged particles FD-2902

Card 1/1 Pub. 146 - 2/19

Author : Kaplan, S. A.

Title : Theory of the acceleration of charged particles by isotropic gas-magnetic turbulent fields

Periodical : Zhur. eksp. i teor. fiz., 29, October 1955, 406-416

Abstract : The author analyzes the theory of the acceleration of charged particles by an isotropic gas-magnetic turbulence. He obtains the kinetic equation for the determination of the spectrum of fast particles, and gives a method for its solution for various cases (stationary and nonstationary spectrum, the taking into account of magnetic braking losses, etc.). In the present work the author makes extensive use of the methods in the theory of shower process in cosmic rays. Twelve references: e.g. S. A. Kaplin [sic], Tsirk. L'vovsk. astronom. observ., No 27, 1953; S. A. Kaplan, DAN SSSR, 94, 33, 1954; ZhETF, 27, 699, 1954.

Institution : L'vov University

Submitted : May 31, 1954

KAPLAN,S.A.

Structural, correlation, and spectral functions of interstellar gas turbulence. Astron.zhur. 32 no.3:255-264 My-Je '55.
(MLRA 8:8)

1. L'vovskaya astronomicheskaya observatoriya
(Gases, Interstellar)

KAPLAN, S.A

Category : USSR/Radiophysics - Application of radiophysical methods I-12

Abs Jour : Ref Zhur - Fizika, No 1, 1957 No 2003

Author : Kaplan, S.A.

Title : On the Theory of the Fermi Mechanism

Orig Pub : Tr. 5-go soveshchaniya po vopr. kosmogonii. 1955, M., AN SSSR, 1956, 508-511

Abstract : A kinetic equation is derived for the energy spectrum of electrons, and an approximate solution is obtained for the stationary and non-stationary cases. In the latter case (when the magnetic field first increases, and then starts to decay), the exponent in the spectrum first diminishes from infinity to a minimum value, and then again increases.

Card : 1/1

KAPLAN, S.A.

[redacted]

Repqiring instruments and spare parts. Izm.tekh. no.1:94-95 '56. (MLRA 9:5)

(Measuring instruments--Repairing)

KAPLAN, S. A.

Category : USSR/Atomic and Molecular Physics - Gases D-7

Abs Jour : Ref Zhur - Fizika, No 2, 1957 No 3548

Author : Kaplan, S.A., Stanyukovich, K.P.
Inst : ~~L'vov University~~, USSR
Title : On the Solution of Inhomogeneous Problems of One-Dimensional Motion in Magnetic Gas Dynamics.

Orig Pub : Zh. eksperim. i teor. fiziki, 1956, 30, No 2, 382-385

Abstract : Discussion of the solution of equations of one-dimensional motion in magnetic gas dynamics for the case of inhomogeneous distribution of the gas parameters. Particular solutions are studied for the case of variable entropy.

Card : 1/1

KAPLAN, S.A.

Shock waves in interstellar space. Astron.zhur. 33 no.5:
646-653 S-O '56. (MLRA 9:12)

1. L'vovskaya astronomicheskaya observatoriya.
(Interstellar matter)

KAPLAN, S.A.

PHASE I BOOK EXPLOITATION 339

Astapovich, Igor' Stanislavovich, and Kaplan, Samuil Aronovich

Vizual'nyye nablyudeniya iskusstvennykh sputnikov Zemli (Visual Observation of Artificial Earth Satellites) Moscow, Gostekhizdat, 1957, 81 p. 10,000 copies printed.

Ed.: Rakhlin, I. Ye.; Tech. Ed.: Murashova, N. Ya.

PURPOSE: This book is written to present information on artificial earth satellites, restricted to problems of visual and optical observation for which only the form, dimensions, and reflecting power of the satellite need be known. For technical problems - carrier rockets, orbits, equipment, etc. - the reader is referred to existing literature.

Card 1/8

COVERAGE: The book gives basic information on the motions of artificial earth satellites, on the conditions of their visibility, and on methods of visual observation of satellites. The methods discussed in the book permit an approximate determination of the satellite orbit, calculation of the instant of passage of the satellite above given geographic points, and evaluation of the conditions for the observations. The last chapter deals with the problem of organizing and equipping stations for visual observation of satellites; the methods used for such observations are described and some suggestions are made on how to utilize such stations also for investigation of "telemeteors". The book contains 2 tables and 17 figures, whose legends are translated in order to indicate more fully the scope of the book. The authors express gratitude for valuable advice to A. M. Lozinskiy.

TABLE OF CONTENTS:

Preface 4

Introduction. Importance of visual and optical observations of an artificial earth satellite 7

Ch. I. Motion of an Artificial Earth Satellite 9

Section 1. Parameters of the orbit of an artificial earth satellite 9

Section 2. Effect of the resistance of the air on the motion of an artificial earth satellite 20

Section 3. Effect of the flattening of the earth and of the heterogeneous structure of the earth's crust on the motion of an artificial earth satellite 29

Section 4. Frequency of passages of an artificial earth satellite over a given geographic parallel 35

Ch. II. Conditions for Observation of an Artificial Earth Satellite 46

Section 5. Visible stellar magnitude of an artificial earth satellite 46

Section 6. Twilight phenomena 52

Section 7. Conditions of visibility of an artificial earth satellite 53

Section 8. Possibility of photographic and photoelectric observations of an artificial earth satellite 57

Ch. III. Stations For Visual and Optical Observation of Artificial Earth Satellites 60

Section 9. Optical limit of a station for visual and optical observation of artificial earth satellites 60

Section 10. Equipment of a station for visual and optical observation of artificial earth satellites 64

Section 11. Methods of visual observation of artificial earth satellites 71

Section 12. Utilization of stations for visual and optical observation of artificial earth satellites for investigation of meteors 77

References 83

Table 1. Structure of the Earth's Atmosphere According to Rocket and Meteor data (1956)

Table 2. Probability P of Observation of an Object from the Side View as a Function of its Angular Position and Apparent Brightness

Fig. 1. Angular elements of the orbit of an artificial earth satellite (inclination, direct ascent of the ascending node, declination of perigee, line of nodes, lines of apsides)

Fig. 2. Orbits of direct, reverse, polar, and equatorial satellites

Fig. 3. Schematized motion of the first Soviet sputnik during a 24-hr period

Fig. 4. Secular displacement of the line of nodes

Fig. 5. Projection of the perturbing acceleration onto the parallel of geographic latitude and onto the meridian of the place

Fig. 6. Projection of the trajectory of an artificial earth satellite onto the earth's surface near the point of observation

Fig. 7. Projection of the ascending and the descending half loops relative to the parallel of the point of observation

Fig. 8. Passage of an artificial earth satellite near the observer at the ascending and descending half loops of the orbit

Fig. 9. Determination of the zenith distance of an artificial earth satellite

Fig. 10. Dispersion of sunlight by an artificial earth satellite

Fig. 11. Relation between the apparent stellar dimension of an artificial earth satellite and the angular elevation

Fig. 12. Limiting position of the sun below the horizon at which an artificial earth satellite ceases to be visible

Fig. 13. Optical limit of a station for visual observation of artificial earth satellites

Fig. 14. Width of optical barrier band

Fig. 15. AT-1 optical instrument

Fig. 16. American - made optical instrument for observation of artificial earth satellites

Fig. 17. Celestial chart with superposed template (grid in the field of vision of the AT-1 optical instrument). The trajectory of an artificial earth satellite is represented; the crosses indicate the intersection of the grid points by the satellite.

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Card 8/8

KAPLAN, S. A.

"Mechanisms of Formation of Interstellar Gas Clouds,"
"Shock Waves in Magneto-Gasodynamic Turbulence,"
"The Formation of Interstellar Gas Clouds,"

Three paper submitted at the Third Symposium on Cosmical Gas Dynamics, 24-29 Jun 1957, Cambridge, Mass.

KAPLAN, Samuil Aronovich (L'vov State Univ) awarded sci degree of Doc Physical-Math Sci for 6 May 57 defense of dissertation: "Methods of gasodynamics in interstellar areas" at the Council, Mos St Univ imeni Lomonosov; Prot No 2, 18 Jan 58.
(BMVO, 6-58, 12)

KAPLAN, S.A.

124-58-9-10020

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 9, p 82 (USSR)

AUTHORS: Kaplan, Kolodiy [Kaplan, S. A., Kolodiy, B. I.]

TITLE: Functional Equations of Magnetohydrodynamics (Funktsional'nyye uravneniya magnitnoy gidrodinamiki) [Funktsional'ni rivnyannya mahnitnoyi hidrodynamiky]

PERIODICAL: Dopovidi ta povidomlennya. L'vivs'k. un-t, 1957, Nr 7, part 3, pp 229-230

ABSTRACT: By means of Hopf's method (Hopf, E., J. Rational Mech. Analysis, 1952, Vol 1, p 87) a functional equation is obtained, describing the magnetohydrodynamic turbulence in an incompressible liquid:

$$\frac{\partial\Phi}{\partial t} = \int_R y_\alpha \left(i \frac{\partial}{\partial x_\beta} \frac{\partial^2\Phi}{\partial y_\alpha(x)\,dx\,\partial y_\beta(x)\,dx} - \right.$$

$$- \frac{i}{4\pi\rho\mu} \frac{\partial}{\partial x_\beta} \frac{\partial^2\Phi}{\partial z_\alpha(x)\,dx\,\partial z_\beta(x)\,dx} + \frac{i}{8\pi\rho\mu} \frac{\partial}{\partial x_\alpha} \frac{\partial^2\Phi}{(\partial z_\beta(x)\,dx)^2} +$$

$$\left. + \nu \frac{\partial^2}{\partial x_\gamma^2} \frac{\partial\Phi}{\partial y_\alpha(x)\,dx} + \frac{\partial\Pi}{\partial x_\alpha} \right) dx +$$

$$+ \int_R z_\alpha \left(i \frac{\partial}{\partial x_\beta} \frac{\partial^2\Phi}{\partial y_\alpha(x)\,dx\,\partial z_\alpha(x)\,dx} - \right.$$

Card 1/2

124-58-9-10020

Functional Equations of Magnetohydrodynamics

$$-i\frac{\partial}{\partial x_\alpha}\frac{\partial^2\Phi}{\partial y_\alpha(x)\,dx\,\partial z_\beta(x)\,dx}+\frac{1}{4\pi\sigma\rho}\frac{\partial^2}{\partial x_\gamma^2}\frac{\partial\Phi}{\partial z_\alpha(x)\,dx}\Big)dx$$

This equation is satisfied by a functional which is determined by the equation

$$\Phi(y(x),z(x),t)=\int_\Omega e^{i(y_\alpha v_\alpha+z_\alpha B_\alpha)}\,dP^t(v,B)$$

1. Conical bodies--Surface properties 2. Conical bodies--Motion 3. Conical bodies--Mathematical analysis 4. Bodies of revolution--Supersonic characteristics 5. Mathematics--Applications

A. G. Kulikovskiy

Card 2/2

KAPLAN, S.A.; KRAVCHUK, A.N.

Statistical theory of gravitating systems. Dop. ta pov. L'viv. un. no.7 pt.3:230-232. '57. (MIRA 11:2)
(Mechanics, Celestial)

KAPLAN, S.A.

Absorption lines for interstellar gases. TSir.Astron.obser.L'viv.un. no.33:1-5 '57. (MIRA 13:10)
(Gases, Interstellar--Spectra)

KAPLAN, S.A.

Theory of statistical acceleration of charged particles by isotropic gas-magnetic fields. TSir.Astron.obser.L'viv.un. no.33:6-25 '57. (MIRA 13:10)

(Particles (Nuclear physics)) (Magnetic fields)

KAPLAN, S.A.

Nomograms for calculating gas-magnetic shock waves. TSir.Astron. obser.L'viv.un. no.33:26-28 '57. (MIRA 13:10)
(Shock waves)

AUTHOR: Kaplan, S. A. 500

TITLE: Shock waves in interstellar space. II: Ionisation discontinuities. (Udarnye volny v mezhzvezdnom prostranstve. II. Ionizatsionnye razryvy).

PERIODICAL: "Astronomicheskiy Zhurnal" (Journal of Astronomy), 1957, Vol.34, No.2, pp. 183 - 192 (USSR).

ABSTRACT: As was shown by Stromgren (1), the transition zone between areas of ionised (HII) and unionised (HI) hydrogen in interstellar space is relatively narrow (its thickness is of the order of $1/n_1 k_\nu \approx 1.6 \times 10^{17}/n_1$ cm where n_1 is the number of neutral atoms of hydrogen in a unit volume, and k_ν the coefficient of absorption from the first level). The temperature in HII areas is of the order of 1000° while in HI areas it is less than 1000° and probably near 100°. It follows that the transition zone between HII and HI areas can be at rest relative to the gas only if the pressures on either side of it are equal, i.e. densities are inversely proportional to the temperature. This condition often does not hold, and as a result, gas flows through this transition zone. In such a case an ionization discontinuity appears, and moves relative to the interstellar gas. In this work, the results of investigations (carried

Shock waves in interstellar space. II: Ionisation discontinuities. (Cont.)

out in the period 1954-1955) into the motion of such ionisation discontinuities, are reported. Similar work has already been reported in refs. 2, 3, 4. In order to derive relations which determine the change in gas parameters when the gas flows through the ionisation discontinuity, the usual concepts of constant mass transport and constant momentum transport are employed over control boundaries on both sides of the discontinuity. It is shown that

$$v_1 = \left[\sqrt{2RT_2} + \frac{1}{2}\,\frac{h\nu_0}{cm_H}\right] \pm \sqrt{\left[\sqrt{2RT_2} + \frac{1}{2}\,\frac{h\nu_0}{cm_H}\right]^2 - RT_1}$$

where v_1 is the perpendicular component of gas velocity relative to ionisation front, $h\nu_0$ - ionisation energy, R - the gas constant, T - temperature. Postscripts 1 and 2 refer to HI and HII respectively; m_H is the mass of a hydrogen atom. The positive sign corresponds to an ionisation discontinuity of condensation. Often $T_2 \gg T_1$, hence in the latter case:

Shock waves in interstellar space. II: Ionisation discontinuities. (Cont.)

$$v_1 \approx 2\sqrt{2RT_2}\left(1 - \frac{T_1}{8T_2}\right) + \frac{h\nu_0}{cm_H} \approx 2\sqrt{2RT_2}$$

$$\rho_2 \approx 2\rho_1 , \quad \rho_1 \approx \frac{m_H C_H M}{2\sqrt{2RT_2}}$$

In the other case (negative sign)

$$v_1 \approx \sqrt{2RT_2}\ \frac{T_1}{4T_2} , \quad \rho_2 \approx \rho_1 \frac{T_1}{4T_2} .$$

If, until the passage of the ionisation front, the gas is stationary, then v_1 is equal to the velocity of the front. These expressions lead to values of density (ρ) which do not correspond to actual conditions. It follows that the formation of an ionisation front should be connected with the simultaneous appearance of either a rarefaction wave or a shock wave. It appears that the most realistic wave system in interstellar space is the combination: shock wave of condensation - ionisation wave of rarefaction. The following problem is, therefore, considered. A shock wave is propagated in a quiescent unionised hydrogen (ρ_0, T_0), which compresses the gas to a density ρ_1',

and increases its temperature to T_1. After this follows a region of compressed isothermal hydrogen, in which an ionisation front of rarefaction (density of gas in front of the ionisation front = ρ_1 and is, in general, different from ρ_1'). The problem may be solved relatively simply if the motion is determined by only two parameters which assume independent values (7, 8). In the present case such parameters are the density of the gas ρ_2 and its temperature T_2 (alternatively: ρ_o and T_o may be used as the parameters). Eqs.(13) are the differential equations corresponding to the symmetrical isothermic gas flow (N = 1, 2, 3, for plane, cylindrical and spherically symmetrical flow respectively), assuming that the measure of the emission of the region HII remains constant (M = constant). It follows that both the ionisation front and the shock wave are propagated with constant velocities where

$$v_1 = \eta_1\sqrt{RT_2} \quad \text{and} \quad v_s = \eta_s\sqrt{RT_2}$$

where η is a dimensionless parameter given by

$$\eta = -\frac{r}{t\sqrt{RT_2}}$$

Shock waves in interstellar space. II: Ionisation discontinuities. (Cont.)

Two special cases are then taken up.
(a) $T_2 \gg T_1 \gg T_0$: This regime of flow is only possible if $\rho_2 < 2\rho_0$ (otherwise $v_1 > v_s$). Secondly, the compressed region of unionised hydrogen is very thin and dense, and, therefore, probably unstable (with $T_1 \sim 100^\circ$ and $T_2 \sim 10\,000^\circ$ the relative thickness of this layer is $\sim(800)^{-1}$ and $\rho \sim 400\rho_0$). Thirdly, its temperature would quickly fall to T_0.
(b) $2T_2 = T_1 \gg T_0$: This regime is possible only if $\rho_0 < \rho_2 < 2\rho_0$. Here the thickness of the unionised compressed layer is of the order of the linear dimensions of the whole moving region. However, in this case the gas will be luminescent and its temperature T_1 will fall.

The real state of affairs falls somewhere between the last two cases, but is nearer to (a) provided $T_1 \gg T_0$ and $\rho_0 > \frac{1}{4}\rho_2 = 2 \times 10^{-25}$ M g/cm^3.

Shock waves in interstellar space. II: Ionisation discontinuities. (Cont.)

The general picture of the motion of ionised discontinuities is shown to be as follows (assuming $T_1 \sim 1000^\circ$, $T_0 \sim 100^\circ$, $\rho_0 \sim \rho_2$ $\rho_0 > 2 \times 10^{-25} M$ g/cm^3, M = constant). A shock wave of condensation (compression) with luminescence moves with a velocity $v_s = 2\sqrt{RT_2 (\rho_2/\rho_0)} \sim 18$ km/sec. The density in it is increased by a factor 40. It is followed by a narrow (1/80) region of compressed unionised hydrogen which moves with a constant speed $v = 2\sqrt{RT_2} \rho_2/\rho_0) \sim 18$ km/sec and constant density $\sim 40 \rho_0$. This, in turn, is followed by an ionisation wave of rarefaction with a speed of 0.3 km/sec. (relative to observer this speed is nearly 18 km/sec) in which the hydrogen is ionised and its density falls by a factor of 40. Next, a region of ionised hydrogen follows with a speed $v \sim (\frac{r}{t} - \sqrt{2RT_2}) \sim \frac{r}{t} = 13$ km/sec and the density falls from the value ρ_2 to $0.44\rho_2$. Finally, by $r \leqslant t\sqrt{2RT_2}$ = (13 km/sec)t, the ionised hydrogen is stationary and has a constant density (= $0.44\rho_2$).
8 references, 3 of which are Russian.

L'vov Astronomy Observatory. Recd. May 2, 1956.

KH...., S. M.

AUTHOR: Safronov, V. S. 517

TITLE: Conference on the physics and the origin of planetary nebulae. (Saveshchaniye po fizike i proiskhozhdeniyu planetarnykh tumannostey).

PERIODICAL: "Astronomicheskiy Zhurnal" (Journal of Astronomy), 1957, Vol.34, No.2, pp. 310-311 (USSR).

ABSTRACT: This Conference took place on February 3-4, 1957, at the University of Leningrad. 75 persons took part. V. V. Sobolev gave a review paper on the contemporary state of the physics of planetary nebulae. A. Ya. Kipper and V. M. Tiit gave a paper on "Subdivision of light quanta and the relation of this process to the physics of gaseous nebulae". G. A. Gurzadyan devoted his paper to the dynamics of planetary nebulae. He noted that the most extended bipolar nebulae should be connected with the magnetic field. It is possible that bipolar structure is connected with the existence of a self-field of the nebula and different velocities of dispersion down and across the magnetic field. Gurzadyan considers that the planetary nebula is a remainder of a primary material from which the central nucleus-star was formed. Gradual heating up of the star leads to a gradual expansion of the shell and its final separation.

Conference on the physics and the origin of planetary nebulae. (Cont.)

A communication on "Theory of ionisation waves of shells of stars, in connection with the problem of the origin of planetary nebulae" was given by S. A. Kaplan (cf. this issue p.183). S. B. Pikel'ner and I. S. Shklovskiy discussed the nature of the spherical gaseous corona of the Galaxy. The authors criticised Spitzer's theory of the galactic corona. They consider that the motion of the gas is sustained by the waves propagated from the centre of the Galaxy. I. N. Minin noted the great role played by light pressure in the nebula on the order of the HII region. I. S. Shklovskiy gave a brief version of his work on planetary nebulae published in issue No.3, 1956, of the Stronomicheskiy Zhurnal. B. A. Vorontsov-Vel'yaminov noted that in the majority of cases it is impossible to determine whether a given nebula is optically thin or optically thick. It follows that all scales of distances of planetary nebulae are subject to large systematic errors. P. P. Parenago pointed out that a good scale of distances of planetary nebulae does not as yet exist.

Recd. Feb. 19, 1957.

KAPLAN, S.A.

33-3-3/32

AUTHOR: Kaplan, S. A.

TITLE: Shock waves in interstellar space. III. Gasomagnetic discontinuities. (Udarnye volny v mezhzvezdnom prostranstva. III. Gazomagnitnye razryvy).

PERIODICAL: "Astronomicheskiy Zhurnal" (Journal of Astronomy), 1957, Vol.34, No.3, pp.321-327 (U.S.S.R.)

ABSTRACT: It has been established that a magnetic field exists in the interstellar space and has an energy density comparable with the kinetic energy of the interstellar medium ($H^2 \approx 4\pi\rho v^2$). On the other hand, since shock waves and ionisation discontinuities are often formed in interstellar space, it is expected that magnetic discontinuities also occur. The theory of shock waves in magnetohydrodynamics has been studied by Hoffmann and Teller (1), Helfer (2), Syrovatskiy (3), Lüst (4) and the author of this paper (5). With the exception of Kaplan, all these authors assumed that when the gas passes over a magnetic discontinuity the full energy flow is conserved. Kaplan has shown (5-7) that, because of luminescence, this hypothesis is not entirely correct. In the present work, the formation of magnetic discontinuities is considered, taking into account the luminescence and using the method described by Helfer (6) and the author of

Card 1/9

33-3-3/32

Shock waves in interstellar space. III. Gasomagnetic discontinuities. (Cont.)

this paper (7). The important and difficult problem of stability of these discontinuities is not at present considered but will be the subject of future communications. For simplicity, only those discontinuities are considered which are limited by plane surfaces. In general, the field vector $\underline{H}$ and the velocity vector $\underline{v}$ make angles φ and φ' with the front respectively. The motion of the gas is considered in a coordinate system moving with a relative velocity given by:

$$V = \bar{v} - \frac{v \cos \varphi'}{H \cos \varphi} \cdot \bar{H}$$

It is assumed that $\underline{v}$, $\underline{H}$ and the normal to the front are coplanar. The general method is as follows. Two control surfaces are taken, one on each side of the front, which are such that the region of rapid change in the parameters occurs between these surfaces. Equations are then set up expressing the conservation of mass transport and impulse over these control surfaces:-

Card 2/9

$$J = \rho_1 v_1 \cos \varphi_1 = \rho_2 v_2 \cos \varphi_2$$ (conservation of mass transport)

Shock waves in interstellar space. III. Gasomagnetic discontinuities. (Cont.)

$$\rho_1\left(RT_1 + v_1^2\cos^2\varphi_1 + \frac{H_1^2}{8\pi\rho_1}\sin^2\varphi_1\right) = \rho_2\left(RT_2 + v_2^2\cos^2\varphi_2 + \frac{H_2^2}{8\pi\rho_2}\sin^2\varphi_2\right)$$

(normal component of impulse)

$$\rho_1\sin\varphi_1\cos\varphi_1\left(v_1^2 - \frac{H_1^2}{8\pi\rho_1}\right) = \rho_2\sin\varphi_2\cos\varphi_2\left(v_2^2 - \frac{H_2^2}{4\pi\rho_2}\right)$$

(tangential component of impulse)

where v_1 and v_2 are the values of the gas velocity before and after the passage of the discontinuity, H_1 and H_2 the corresponding magnetic fields, and φ_1 and φ_2 the angles between the direction of gas flow, or the magnetic lines of force and the normal. T_1 and T_2 are the temperatures on either side of the discontinuity, the values of which must be prescribed. Furthermore, since div $\underline{H} = 0$, we have

Card 3/9

$$H_1\cos\varphi_1 = H_2\cos\varphi_2$$

Shock waves in interstellar space. III. Gasomagnetic discontinuities. (Cont.)

and

$$J^2 = \rho_2\rho_1 \left\{ \frac{\rho_2 RT_2 - \rho_1 RT_1}{\rho_2 - \rho_1} + \frac{H_1^2 \cos^2\varphi_1}{8\pi(\rho_2 - \rho_1)} (\mathrm{tg}^2\varphi_2 - \mathrm{tg}^2\varphi_1) \right\},$$

$$J^2 = \rho_2\rho_1 \frac{H_1^2 \cos^2\varphi_1}{4\pi} \frac{\mathrm{tg}\,\varphi_2 - \mathrm{tg}\,\varphi_1}{\rho_1 \mathrm{tg}\,\varphi_2 - \rho_2 \mathrm{tg}\,\varphi_1} .$$

It is assumed that the gas pressure is much smaller than the magnetic pressure, both before and after the passage of the discontinuity front. Such discontinuities are called magnetic discontinuities. Under these conditions,

Card 4/9

$$\frac{J^2}{\rho_1\rho_2} = \frac{H_1^2 \cos^2\varphi_1}{8\pi(\rho_2 - \rho_1)} \left[\mathrm{tg}^2\varphi_2 - \mathrm{tg}^2\varphi_1\right] = \frac{H_1^2 \cos^2\varphi_1}{4\pi} \frac{\mathrm{tg}\,\varphi_2 - \mathrm{tg}\,\varphi_1}{\rho_1 \mathrm{tg}\,\varphi_2 - \rho_2 \mathrm{tg}\,\varphi_1}.$$

Shock waves in interstellar space. III. Gasomagnetic discontinuities. (Cont.)

provided

$$p_1 \ll \frac{H_1^2}{8\pi} \quad \text{and} \quad p_2 \ll \frac{H_2^2}{8\pi} .$$

The last equation has the following three solutions:

$$\left.\begin{aligned} \operatorname{tg} \varphi_2 &= \frac{1}{2}\left(\frac{\rho_2}{\rho_1} - 1\right)\operatorname{tg} \varphi_1 \pm \sqrt{\frac{1}{4}\left(\frac{\rho_2}{\rho_1} + 1\right)^2 \operatorname{tg}^2 \varphi_1 + \frac{\rho_2}{\rho_1} - 1}, \\ \operatorname{tg} \varphi_2 &= \operatorname{tg} \varphi_1 , \end{aligned}\right]$$

The plus sign corresponds to an increasing magnetic field. For strong discontinuities and excluding small angles,

$$\operatorname{tg} \varphi_2 \approx \frac{\rho_2}{\rho_1} \operatorname{tg} \varphi_1 .$$

Card 5/9

The last equation corresponds to an increasing field. Combining this with $H_1 \cos \varphi_1 = H_2 \cos \varphi_2$:

Shock waves in interstellar space. III. Gasomagnetic discontinuities. (Cont.)

$$\frac{H_2}{H_1} \approx \frac{\rho_2}{\rho_1} \sin \varphi_1 .$$

The other parameters have the following approximate values:

$$v_1^2 \approx \frac{H_1^2}{8\pi\rho_1} \frac{\rho_2}{\rho_1} \mathrm{tg}^2 \varphi_1 ; \qquad {}_2^2 = \frac{H_1^2}{8\pi\rho_1} \mathrm{tg}^2 \varphi_1 .$$

If $\varphi_1 \to 0$, these equations do not hold. The solution for small angles is indicated in Fig. 1, but is not derived. Finally, if $J \to \infty$ (with $v_1 \to \infty$) then:

$$\frac{\rho_2}{\rho_1} \to \frac{\mathrm{tg}\, \varphi_2}{\mathrm{tg}\, \varphi_1}$$

and

$$v_1 \sin \varphi_1 \to v_2 \sin \varphi_2 .$$

Card 6/9

Shock waves in interstellar space. III. Gasomagnetic discontinuities. (Cont.)

If the magnetic field is parallel to the plane of the discontinuity then the transformation:

$$V = \bar{V} - \frac{v \cos \varphi'}{H \cos \varphi} \cdot \bar{H}$$

does not apply. This is the "perpendicular wave" case. Here:

$$J = \rho_1 v_1 = \rho_2 v_2, \quad \rho_1\left(RT_1 + v_1^2 + \frac{H_1^2}{8\pi\rho_1}\right) = \rho_2\left(RT + v_2^2 + \frac{H_2^2}{8\pi\rho_2}\right).$$

$$v_1 H_1 = v_2 H_2 \quad \text{or} \quad \frac{H_1}{\rho_1} = \frac{H_2}{\rho_2} = b\sqrt{8\pi},$$

Card 7/9

Combining the last two equations:

$$\rho_1(RT_1 + v_1^2 + b^2\rho_1) = \rho_2(RT_2 + v_2^2 + b^2\rho_2)$$

where b is a constant. Thus, the effect of the magnetic field on the perpendicular gas shock wave can be taken into account by replacing the gas pressure ρRT by the effective

33-3-3/32

Shock waves in interstellar space. III. Gasomagnetic discontinuities. (Cont.)

pressure $\rho RT + b^2\rho_2$. As was shown in (8), this applies also in a number of other cases. Using formulae (12) given in an earlier paper of the author (6), we obtain:

$$\frac{\rho_2}{\rho_1} = \frac{1}{2}\frac{v_1^2 + RT_1}{RT_2 + b^2\rho_1} \pm \sqrt{\frac{1}{4}\left(\frac{v_1^2 + RT_1}{RT_2 + b^2\rho_1}\right)^2 - \frac{v_1^2 + b^2\rho_1}{RT_2 + b^2\rho_2}},$$

$$\frac{\rho_2}{\rho_1} = \frac{v^2}{RT_2 + H_1^2/8\pi\rho_1},$$

$$\frac{\rho_2}{\rho_1} \approx \frac{8\pi\rho_1 v_1^2}{H_1^2}$$

Card 8/9

In the last paragraph, the aoutomodel problem is formulated for the isothermal gasomagnetic motion in accordance with

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PHASE I BOOK EXPLOITATION 1099

Kaplan, Samuil Aronovich

Kak uvidet', uslyshat' i sfotografirovat' iskusstvennyye sputniki zemli. (How to See, Hear and Photograph Artificial Earth Satellites) Moscow, Fizmatgiz, 1958. 78 p. 50,000 copies printed.

Ed.: Levantovskiy, V.I.; Tech. Ed.: Yermakova, Ye.A.

PURPOSE: This popular pamphlet is written to explain to the general reader how to observe visually or photographically an artificial satellite.

COVERAGE: The booklet, by giving a few basic formulas, describes in very simple terms the nature of artificial satellites, their relationship to the Earth, and the means of systematic ground-based observation. A list of Soviet permanent stations is appended. There are 26 figures and 4 maps and 9 Soviet references.

TABLE OF CONTENTS:

Preface 3

1. Earth Artificial Satellites 5

How to See, Hear and Photograph (Cont.) 1099

2. Variations in Rotation Period of an Artificial Satellite 10
3. Movement of a Satellite Relative to the Earth's Surface 14
4. Conditions of Satellite Visibitity 25
5. Stellar Sky 29
6. How to Observe the Artificial Satellite by the Naked Eye 34
7. Optical Instruments for Visual Observations of the Satellites 40
8. Observation of Satellites by Binoculars 47
9. Photographic Observation of Satellites 52
10. How to Listen to Radio Signals from Satellites 58
11. Determination of the Distance to a Satellite, of the Rotation Period, and of Its Elevation Over the Earth's Surface 60
12. Forecasting the Passage of a Satellite 69
13. Organization of Satellite Observation 73

Literature 76

Addenda:
1. Table of Contents for the Orbits of Artificial Satellites of the Earth 76
2. List of Soviet Ground-based Stations for Visual Observations of Artificial Satellites of the Earth 78

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Card 2/2 1-14-59

3(1); 10(2) PHASE I BOOK EXPLOITATION SOV/1375

Kaplan, Samuil Aronovich

Mezhzvezdnaya gazodinamika (Interstellar Gas Dynamics) Moscow, Fizmatgiz, 1958. 194 p. 2,500 copies printed.

Ed.: Samsonenko, L.V.; Tech. Ed.: Gavrilov, S.S.

PURPOSE: This book is intended as a textbook for advanced students of astronomy and practicing astronomers. It may also assist astronomers in mastering the theoretical apparatus of gas dynamics for application to astrophysical problems.

COVERAGE: The book gives a systematic exposition of the basic methods of hydrodynamics, gasdynamics, and magnetohydrodynamics particularly as applied to the study of problems in interstellar gas dynamics. It is primarily concerned with the distribution, motion, and physical state of interstellar gases. It discusses discontinuities of motion, propagation of disturbances, ionization and gasemagnetic effects, interstellar turbulence, and the structure of nebulae. The author expresses his gratitude to S.B. Pikel'ner who reviewed the manuscript and made many valuable comments. There are 38 figures. Of the 99 references, 36 are Soviet, 31 English (3 of which have also appeared in Russian translation), 21 Dutch, 5 German, 4 French, 1 Swedish, and 1 Japanese.

Card 1/3

Interstellar Gas Dynamics SOV/1375

TABLE OF CONTENTS:

Preface 5

Ch. I. Distribution and Motion of Interstellar Gas 7
1. Components of the interstellar medium 9
2. Cloud-like structure of interstellar gas. Intercloud medium 16
3. Spiral type structure 25
4. Fibrous structure of nebulae 31

Ch. II. Physical State of Interstellar Gas 38
5. Ionization of interstellar hydrogen. Radiation pressure 38
6. Temperature of interstellar gas 47
7. Interaction of interstellar gas with magnetic fields 55
8. Relativistic particles in interstellar space 62

Ch. III. Discontinuities in the Motions of Interstellar Gas 66
9. Elementary theory of shock waves 67
10. Decaying shock waves 73
11. Ionized discontinuities 93
12. Gasmagnetic discontinuities 101

Card 2/3

Interstellar Gas Dynamics SOV/1375

Ch. IV. Equations of Motion of Interstellar Gas 109
13. Equations of motion of magnetogasdynamics 109
14. One-dimensional and self-similar motions of interstellar gas 117
15. Motion of ionized discontinuities 130
16. Propagation of weak disturbances and the problem of stability of the motions 141

Ch. V. Interstellar Turbulence 152
17. Theory of gasmagnetic turbulence 152
18. Observations of interstellar turbulence 170
19. Cloud-like structure and interstellar turbulence 184
20. Spiral structure of galaxies and fibrous structure of nebulae 189

References 192

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Card 3/3

29(1) PHASE I BOOK EXPLOITATION SOV/1235

Baum, Fillipp Abramovich, Kaplan, Samuil Aronovich, Stanyukovich, Kirill Petrovich

Vvedeniye v kosmicheskuyu gazodinamiku (Introduction to Space Gas Dynamics) Moscow, Fizmatgiz, 1958. 424 p. 4,000 copies printed.

Ed.: Fridman, V.Ya.; Tech. Ed.: Gavrilov, S.S.

PURPOSE: The purpose of this book is to present to astronomers and physicists the most advanced methods of gas dynamics, to be used for solving various astrophysical and physical problems.

COVERAGE: The book is divided into three parts, each of which is essentially complete within itself. The first part presents the fundamentals of gas dynamics as applied to the motions of cosmic gaseous masses in the absence of magnetic fields. Included in this part are the theory of shock waves and the theory of unsteady motions of a gas, the main emphasis being on the motions of a gas in a gravitational field. The applications of theoretical methods to nonstationary stars and to various geophysical problems are given.

Card 1/9

The second part presents the fundamentals of magnetic gas dynamics, which is concerned with the motions of an electrically conducting gas in a magnetic field. This part also considers in detail the statistical theory of turbulence. The theoretical methods are applied to several astrophysical problems. The third part presents the foundations of relativistic gas dynamics and relativistic magnetogasdynamics, both of which deal with dynamic characteristics of gases at velocities near the speed of light. The book is primarily theoretical, and the authors state that much experimental work remains to be done. F.A. Baum wrote chapters II - V of the first part and with K.P. Stanyukovich wrote chapter IX. S.A. Kaplan is the author of the entire second part and also of chapter I of the first part. Stanyukovich wrote chapters VI - VIII and section 12 of the first part, sections 3, 3 a), and 8 a) of the second part, and the entire third part of the book. The authors thank M.A. Leontovich, D.A. Frank-Kamenetskiy, A.M. Yaglom, S.Z. Belen'kiy, S.V. Pikel'ner, and S.I. Syrovatskiy for reviewing various parts of the book in the manuscript and making a number of valuable comments. There are 187 references, 82 of which are Soviet, 87 English, 11 German, 2 Flemish, 2 Swedish, 1 Danish, 1 French, 1 Italian.

TABLE OF CONTENTS:

Preface 7

PART I. SPACE GAS DYNAMICS 11

Ch. I. Equations of Space Gas Dynamics 11
1. Equations of motion in space gas dynamics 11

Ch. II. Shock Waves 15
2. Elementary theory of shock waves 15
3. Two-dimensional straight shock waves and their properties 22
4. Structure of shock waves 31
5. Straight reflection of shock waves 34

Ch. III. Oblique Shock Waves 36
6. Derivation of the basic relationships 36
7. Reflection of oblique shock waves 45

Ch. IV. Collisions Of Gaseous Masses And Solid Bodies 57

APPROVED FOR RELEASE: 06/13/2000 CIA-RDP86-00513R000520430012-4"

8. Basic parameters of waves on the boundary of separation between two media 57
9. Collision of two solid bodies 63

Ch. V. Shock Waves With Consideration Of The Processes Of Dissociation And Ionization Of The Particles Of The Medium. Interaction With Radiation 66
10. Statistical method for calculating the thermodynamic functions 67
11. Shock waves in the presence of particle ionization and dissociation processes 75
12. Shock waves in the presence of interaction between the medium and radiation 83

Ch. VI. Solution Of The Equations Of Gas Dynamics, Unsteady Motions Of A Gas 88
13. One-dimensional motion of a gas 88
14. General solution of the equations of one-dimensional isentropic motions of a gas 92
15. Dispersion of a two-dimensional layer of a gas into a vacuum 98

16. Reflection of a rarefaction wave. Two-sided dispersion 102
17. Redistribution of the energy and impulse in a non-stationary flow 110
18. Dispersion of a gas in the case of resistance of the external medium 111
19. Three-dimensional motions. Problem of a strong explosion 117

Ch. VII. Motion Of A Gas In A Gravitational Field 130
20. Steady-state motions of a gas in the gravitational field 130
21. Dynamically similar motions in a characteristic gravitational field 137
22. Unsteady one-dimensional motions in a gravitational field 141

Ch. VIII. Some Problems In The Gas Dynamics Of Nonstationary Stars 150
23. Several methods for solving the problems of the motion of gas in stars 150
24. Various cases of motion of the gas in stars 157

Ch. IX. Geophysical Supplements To Gas Dynamics Methods 176
25. Motion of meteoritic bodies in the atmosphere 176
26. Impact of meteorites on the surface of a planet 191
27. On the nature of the earth's volcanism 201

References 208

PART II. MAGNETOGASDYNAMICS

Introduction 209

Ch. I. Equations Of Magnetogasdynamics 212
1. Equations of motion. Change in the intensity of a magnetic field during motion of the gas 212
2. Solution of the equations of magnetogasdynamics in the case of unsteady one-dimensional motion 219
3. Motion of a gas in an electromagnetic field. Characteristics of the equations for a medium with finite conductivity 222
3a) Dynamically similar motions in a medium with finite conductivity 235

4. Propagation of weak disturbances 240

Ch. II. Gas magnetic Discontinuities 245
5. Classification of discontinuities 245
6. Perpendicular gas magnetic shock waves 246
7. Oblique gas magnetic shock waves and magnetohyrodynamic waves 251
8. Gas magnetic compression shocks 255
8a). Shock waves in a medium with finite conductivity 260

Ch. III. Stability Of A Motion In Magnetogasdynamics 264
9. Stability of magnetogravitational configurations 264
10. Investigations of the stability of gas magnetic motions 270
11. General conclusions on the stability of a motion in magnetogasdynamics. Theorem of the conservation of circulation velocity 275

Ch. IV. Statistical Theory Of Isotropic Gas Magnetic Turbulence. Correlation Method 278

12. Introductory remarks 278
13. Correlational equations of the statistical theory of isotropic hydromagnetic turbulence 287
14. On the solution of the correlational equations 291
15. Loytsyanskiy's invariant 297
16. Relationship between the pressures, temperatures, and other parameters in the case of isotropic hydromagnetic turbulence 300

Ch. V. Statistical Theory Of Isotropic Gas Magnetic Turbulence. Spectral Method 305
17. Spectral functions 305
18. Spectral equations 308
19. Solution of the spectral equations of isotropic gas magnetic turbulence for the stationary case 315
20. Solution of the spectral equations of nonstationary isotropic gas magnetic turbulence 322
21. Spectral functions of isotropic gas magnetic turbulence 331
22. Chandrasekar's theory for hydromagnetic turbulence 337
23. Turbulence under interstellar conditions 340

References 346

Card 8/9